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## NOTES ON PYRAMIDULA ELRODI PILS.

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This shell was first collected on the sides of the Mission Mountains, above Post Lake, in the summer of 1899. About forty were taken, all dead. Specimens were sent to Dr. Pilsbry, of the Philadelphia Academy of Sciences, who described the species in NAUTILUS, Vol. XIV, 40, naming the shell after the collector.

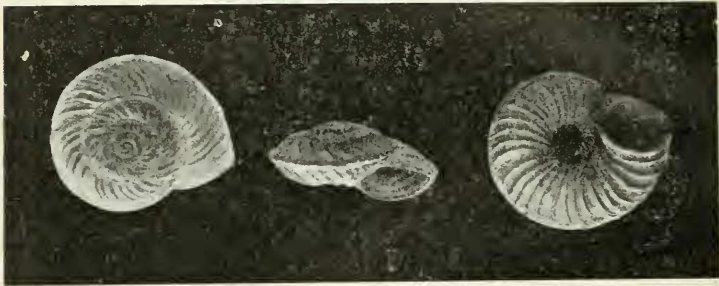
During the collecting expedition of the University of Montana Biological Station, in July, 1900, a stay of ten days was made at McDonald Lake for the express purpose of making further investigations of this species. During this time some three quarts of specimens were collected, of all sizes and varying colors, from the dark brown of the living shells to the bleached white of the dead ones. Also some three dozen living snails were secured, which were drowned, and in a number of cases, beautifully expanded.

The distribution of the species, so far as known, appears to be quite local, and is deserving of further study. At present it seems confined to the mountain slopes forming the amphitheatre around and to the east of Post Lake. On the south side of the lake, owing to the dryness of the rocks and soil, it appears very scarce, one living and several dead shells being the result of an afternoon's search. A search on the north bank during the same time on the same day resulted in a quart of shells, a dozen living. While no search has been made in the mountain slopes east of the lake, there can be little doubt of its presence, since the shell is found on both sides of the lake.

On the north slope of the lake four small streams tumble over the

rocky wall of the mountains, making beautiful little cascades. The first of these, beginning next the plain, appears to come out of the rocks high up, flows through a small canon between the cliffs, and shortly afterward disappears in the loose talus below. Earlier in the year these loose, talus rocks are wet with melted snow, but at the time of collecting, in July, they were hot and dry.

On the talus below the first fall, shells were found abundantly. On the talus of the ravine, a few feet to the west, only a few were found, while still further west none whatever could be found anywhere. This little stream from the mountain, therefore, seems to mark its distribution on the mountain towards the west. Acting on this basis, the rocks were followed upward along the sides of the



mountain, following the little gully of the stream mentioned. Shells were found as high as we went, a distance of 1,500 feet, or up to a total elevation of 5,000 feet above the sea. Time did not permit a search higher.

The limit of distribution of the shells, as mentioned, ends abruptly. A search eastward from the mountain stream caused the discovery of shells in abundance for a mile; beyond this we did not go. There is a great deal of difficult mountain climbing necessary to explore these regions, and a half day does not permit one to go far. But from the fact that they have been found on the slopes of Mt. McDonald, across the lake to the south, it would appear evident that the unexplored canons and mountain sides forming the large amphitheater supplying the lake's waters, support the *Pyramidulas*.

The writer has been in different places in the Mission range, from one end to the other, on the western slopes, and nowhere else have

the shells been found. Whether or not they are on the eastern slopes, on the Swan river side, is yet to be determined.

The habits of the shells are very peculiar. Shells are rarely found among the bushes or where there is much vegetation. They are found on the surface among the loose rocks of medium size, but not among the large boulders or the finer talus. When bleached, they are a beautiful white, their color against the dark brown or lichen-colored sandstone making them very conspicuous objects. The corrugations show plainly from a distance, and there is no difficulty whatever in seeing the dead shells when in the region where they are to be found.

The living ones are not so easily discovered. They are dark brown, almost identical in color with the rocks among which they live, and very easily overlooked. When the animal dies the color changes to a delicate pink, and later the shell becomes a beautiful clear and pearly-white.

A search was begun for living shells by following up the talus where the shells were found most abundantly. After descending over a thousand feet, we came to a small ledge of rock forming a sharp promontory with a cliff below, on which we stopped to take a photograph of McDonald Peak, which showed up beautifully from this point. This ledge forms the western wall for the small canon through which the aforementioned stream comes. The loose rocks on the top of the cliff were overturned. It was with much surprise that shells were picked up, and among them one apparently alive. Diligent search revealed the fact that this small ledge, not more than thirty feet in extent, was the home of a colony of these interesting creatures. A quart of shells was secured, among them a dozen live ones, the first ever found. This ledge is shown on the left of the picture.

This home of the shell is very interesting and romantic. Living on the cliffs of one of the most rugged ranges in the State, with scant vegetation, it has a life common to few shells. It prefers the crannies among the loose rocks, hiding there from enemies.

After finding this first colony, a second trip was made over the same route, only farther up the mountain. Other colonies were found, with occasionally a live one. Search was then made lower down, among the rocks near the lake, resulting in finding live ones at different places, though to do so required considerable digging in

the rocks, in order to get down below the hot, dry rocks to where there was a little moisture.

It seems apparent that the living shells live among the loose stones, in the early spring crawling around over the damp rocks. As the warm spring and summer days approach, the rocks become dry. The snails previously crawling over them cease activity, and instead of all of them crawling for protection under the loose rock, some throw their protective film across the opening of the shell while yet on the rocks; the sun kills the animal, which dies, leaving the dead shell to bleach and become a conspicuous feature on the rocks. Here the shells remain, very few of them washing any distance.

All of the living shells taken appeared dead except a few. Invariably, however, when a shell sank in water the snail within was alive. It is probable that the species is continued by the hibernation of some of the more fortunate individuals which are deeper in the rocks, where there is more moisture.

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#### ADAPTATION OF MOLLUSKS TO CHANGED CONDITIONS.

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Many years ago the Ohio river at and below Cincinnati, Ohio, was one of the most prolific hunting grounds of the collector of the fresh-water species of mollusks. At that time abounded in immense numbers (as is shown by the large quantities of duplicates in the collections of all the old collectors) *Anculosa praerosa* Say. About twelve years ago this shell disappeared almost entirely and for many years not a single specimen was found; this year, however, a few adults and large numbers of young shells have been found in localities where it is certain that no shells have existed for many years. The explanation of this occurrence is as follows; *A. praerosa* Say was a long time ago one of the most common of the river snails; the growth of the city of Cincinnati and the numerous factories along the banks of the river, each and every one adding to the filth of the water, pouring in sewage and acids, have rendered the water so foul that the *Anculosa* of the old day have been exterminated, all but a few of the most hardy of the species, which probably crawled to the lowest and most inaccessible parts of the river, where they managed to exist and to produce young: the young shells have become more used to the changed conditions, which worked such havoc with their ancestors,